SPRAY BOX FOR APPLYING STAIN, PAINT, OR OTHER COATINGS TO BOARDS

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Field of the Invention

This document concerns an invention relating generally to tools for applying paint, stain, varnish, sealant, or other liquid coatings to workpieces, and more specifically to tools for rapid spray application of coatings to multiple planks, trim pieces, or other elongated boards.

Background of the Invention

Painting and finishing contractors often need to perform jobs wherein numerous pieces of trim (e.g., window/door trim, door casings, baseboards, bandboards, crowns, etc.) need to be stained, painted, or otherwise finished. This is commonly done by placing the boards on sawhorses and using a rag, sponge, brush, or spraygun to deposit the desired coating on the boards, and then sometimes removing any excess coating from the boards by wiping them with a rag or paint roller. Because there may be many linear feet of board to coat – perhaps thousands of feet, if the project is large (e.g., for office complexes, hotels, and government buildings) – the job can be very time-consuming. It

can also be messy and wasteful, particularly where the liquid coating is applied by a spraygun, since a significant amount of the coating may be lost to overspray (i.e., the spray fails to land on the board to be coated). Even where spray application is not used, mess and loss can occur where more coating is applied than needed, and from coating dripping from the boards. In general, the faster the application method (as with spray coating), the greater the waste of the liquid coating and the greater the time that will later be lost to cleanup. It would therefore be useful to have devices and methods which would allow rapid coating of boards with minimal or no lost coating, and little or no cleanup time after all boards have been coated.

Summary of the Invention

The invention involves a spray box which is intended to at least partially solve the aforementioned problems. To give the reader a basic understanding of some of the advantageous features of the invention, following is a brief summary of preferred versions of the spray box, with reference being made to the accompanying drawings to better assist the reader's understanding. As this is merely a summary, it should be understood that more details regarding the preferred versions may be found in the Detailed Description set forth elsewhere in this document. The claims set forth at the end of this document then define the various versions of the invention in which exclusive rights are secured.

Referring to the accompanying **FIGS. 1** and **2**, preferred versions of the portable spray box **100** include a box floor **116** bounded by opposing box floor sides **118** extending between opposing box floor entry and exit ends **120** and **122**. A pair of opposing sidewalls **110** (with the reference numeral **110** being used to generically refer to the sidewalls **110U** and **110L** on upper and lower portions **102** and **104** of the spray box **100**) rise from the box floor **116** at its box floor sides **118**, and a pair of opposing box endwalls **112** rise from the box floor **116** at its box floor entry and exit ends **120** and **122** to extend between the sidewalls **110** (with the reference numeral **112** similarly being used to generically refer to the endwalls **112U** and **112L** on upper and lower portions **102** and **104** of the spray box **100**). A box roof **108** then extends between the box sidewalls **110** and box endwalls **112** above the box floor **116**. The box endwalls **112** each have a board passage aperture **126** defined therein, with the board passage apertures **126** being aligned to define a board passage **130** extending through the spray box **100** between the box floor entry and exit ends **120** and **122**. Support rollers **136** are then provided along the board passage **130**, as by rotatably mounting them between the box sidewalls **110** or at the portions of the box endwalls **112** defining the mouths of the board passage **130**, with the support rollers **136** being placed and oriented to translatably support boards **10** (see **FIG. 2**) passing through the board passage **130**. The box roof **108** has one or more spray nozzle apertures **132** defined therein, whereby spray nozzles **134** may be situated in the spray nozzle apertures **132** to spray liquid coating (such as stain, varnish, paint, or other decorative and/or protective coatings) on boards **10** rolling along

the board passage **130** on the support rollers **136**. The spray nozzles **134** are supplied with coating liquid by a liquid supply source **140** which is connected in fluid communication with the nozzles **134**, and which is preferably also connected in fluid communication with a drain hole (or holes) **148** at one or more of the box floor **116**, the box sidewalls **110**, and the box endwalls **112**, whereby the liquid supply source **140** may both supply liquid coating to the spray nozzles **134** and also receive any overspray (i.e., sprayed coating which does not coat a board **10** or escape out of the board passage apertures **126**) collected in the spray box **100** near the box floor **116**. Thus, the coating is essentially recycled in a loop where it is sprayed on the board(s) **10** within the spray box **100**, and if it results in overspray, the overspray is collected and again sent through the spray nozzles **134**. A pump **150** (see **FIG. 1**) may be situated in the spray box **100**, e.g., at or in fluid communication with the drain hole **148**, so that collected coating liquid may be pumped back to the liquid supply source **140**. Alternatively or additionally, the coating liquid may be made to drain directly from the spray box **100** to the liquid supply source **140** by having the box floor **116** slope downwardly toward the drain hole **148**, so that overspray is led to drain from the spray box **100** by gravity. If desired, some means for mounting one or more liquid coating application rollers **156** (e.g., common paint rollers, visible only in **FIG. 1**) may be provided in the spray box **100**, or more preferably adjacent its passage aperture **126** at its exit end **122**, so that liquid coating application rollers **158** can be mounted to roll along the surfaces of boards **10** rolling through the

board passage **130** and thereby more evenly distribute any liquid coatings thereon (or remove any excess liquid coating therefrom).

The spray box **100** is preferably mounted on wheeled legs **160** to allow it to be easily rolled from one work location to another, and/or to locations at which the spray box **100** can be easily cleaned out. To further enhance cleanout, the spray box **100** preferably has its sidewalls **110** split along their height so that the spray box **100** is defined in upper and lower portions **102** and **104** which are hinged together, allowing the spray box **100** to be opened in clamshell fashion. Handles **166** are preferably provided on the spray box **100** to allow its upper portion **102** to be easily opened, and/or to allow a user to more easily push/pull the spray box **100** to desired locations.

Further advantages, features, and objects of the invention will be apparent from the following detailed description of the invention in conjunction with the associated drawings.

Brief Description of the Drawings

FIG. 1 is a perspective view of a spray box **100** exemplifying the invention, shown with its upper portion **102** open in relation to its lower portion **104**, and with its spray nozzles **134** displayed in an exploded position "floating" adjacent the open upper portion **102** of the spray box **100** and its drain pump **150** also shown exploded from the drain hole **148** and "floating" thereabove.

FIG. 2 is a perspective view of the spray box **100** of **FIG. 1**, shown with its upper portion **102** closed in relation to its lower portion **104**, and with its spray nozzles **134** situated in its spray nozzle apertures **132**, and with a board **10** traveling through the board passage **130** on the support rollers **136** to have a coating sprayed thereupon by the spray nozzles **134**.

Detailed Description of Preferred Embodiments of the Invention

Looking to **FIGS. 1** and **2**, a spray box exemplifying the invention is depicted generally by the reference numeral **100**. The spray box **100** includes an upper portion **102** joined to a lower portion **104** in clamshell fashion by a hinge **106**. The upper portion **102** includes a box roof **108** bounded by opposing box sidewalls **110U** and box endwalls **112U**, with the box sidewalls and endwalls **110U** and **112U** terminating in the lower lip **114** of the upper portion **102**. The lower portion **104** includes a box floor **116** bounding opposing lateral box floor sides **118** extending lengthwise along the spray box **100** between a box floor entry end **120** and a box floor exit end **122**. Box sidewalls **110L** rise from the box floor sides **118** to terminate in the upper lip **124** of the lower portion **104**, and box endwalls **112L** similarly rise from the box floor **116** at its box floor entry and exit ends **120** and **122**. However, the box endwalls **112L** do not extend to the lip **124** of the lower portion **104** across the entireties of their widths, and thereby define board passage apertures **126** in the endwalls **112L** when the upper and lower portions **102** and

104 of the spray box **100** are closed (as shown in **FIG. 2**). These board passage apertures **126** are aligned to define a board passage **130** (fully visible in **FIG. 1**) which extends through the length of the spray box **100** between its entry and exit ends **120** and **122**.

The box roof **108** includes one or more spray nozzle apertures **132** defined therein (as shown in **FIG. 1**), with the spray nozzle apertures **132** being adapted to removably receive spray nozzles **134** (as shown in **FIG. 2**) for spraying liquid coatings on boards **10** traveling through the board passage **130** between the entry and exit ends **120** and **122**. The spray box **100** preferably includes some means for slidably supporting boards **10** as they pass through the board passage **130**, such as the inner support rollers **136I** rotatably mounted between the box sidewalls **110L** along the board passage **130**, and/or the outer support rollers **136O** rotatably mounted just outside the board passage apertures **126** on a bounding lip **138** extending from the box endwalls **112L**. The support rollers **136I** and **136O** will therefore support a board **10** placed in the board passage **130** below the spray nozzles **134**, and allow the user to easily slide a board **10** between the entry and exit ends **120** and **122** of the spray box **100** as the board **10** is being sprayed.

The spray nozzles **134** are supplied with stain, paint, varnish, sealant, or another coating liquid by a liquid supply source, here depicted as a bucket **140**. A supply hose **142** leads from the bucket **140** to a spray pump **144** (which is simply depicted in the Figures as a box, in schematic fashion, owing to the many different forms the spray pump **144** may take). The spray pump **144** then has a pressurized hose **146** which supplies the

pressurized coating liquid to the spray nozzles **134**, thereby spraying any board(s) **10** within the board passage **130** with the coating liquid (provided the spray nozzles **134** are mounted in the spray nozzle apertures **132**). While multiple spray nozzle apertures **132** and spray nozzles **134** are depicted, only a single aperture **132** and spray nozzle **134** might be provided; similarly, more might be provided than are illustrated in the Figures. Where multiple spray nozzle apertures **132** are provided, they are preferably staggered in different positions across the width of the spray box **100** between its box sidewalls **110L** and **110U**, thereby helping to ensure that spray nozzles **134** positioned at different locations across the width of the spray box **100** will provide complete coverage of a spray coating over at least the upper surface of a board **10** traveling on the support rollers **136I/136O** through the board passage **130**.

Since some amount of overspray is likely to occur (i.e., some of the liquid coating is likely to miss a board **10**, or drip from a board **10**, and thereby collect in the lower portion **104** of the spray box **100**), it is useful to provide some means for capturing and reusing collected overspray. Looking to **FIG. 1**, a drain hole **148** is provided in the box floor **116** so that overspray pooling on the box floor **116** may drain from the box floor **116** into the bucket **140**. The drain hole **148** is usefully fitted with a mesh screen or other filter (not shown) so as to prevent travel of unwanted matter, such as wood chips or other detritus, to the bucket **140**. So that overspray is better directed towards the drain hole **148** for draining, it is useful to have the box floor **116** slope downwardly by at least a

small degree so that the overspray will flow toward the drain hole **148** by gravity (with this downward sloping being so gradual in the spray box **100** depicted in the Figures that such sloping is not visible). Rather than placing the drain hole **148** in the box floor **116**, it could instead be provided on some low portion of the box sidewalls **110L** and/or box endwalls **112L**. Alternatively and/or additionally, a drain pump **150** (**FIG. 1**) may be provided to receive collected coating from the lower portion **104** to the spray box **100**. In **FIG. 1**, such a drain pump **150** is shown raised from the box floor **116** against which the drain pump **150** is to be sealingly engaged, with a pump outlet hose **152** extending through the drain hole **148** to the bucket **140**.

Looking particularly to **FIG. 2**, it is seen that by use of the foregoing arrangement, a liquid coating may be continuously recirculated through the spray box **100** in a loop, with the liquid coating being ejected through the spray nozzles **134** onto boards **10** traveling on the support rollers **136I/136O** through the board passage **130**, and with overspray being collected through the drain hose **152** to return to the liquid supply bucket **140** for resupply to the spray nozzles **134** via the spray pump **144**. Since the upper and lower portions **102** and **104** of the spray box **100** substantially surround any board **10** being sprayed (save for any portions extending outside the spray box **100** through the board passage apertures **126**), most overspray is confined to the spray box **100** (save for any escaping through the board passage apertures **126**). This serves to substantially reduce waste of liquid coatings, as well as greatly reducing mess (and resulting cleanup

time), and also leads to cleaner air in the working environment. Additionally, boards **10** are coated much more quickly, not only because the coating process is "semi-automated" by wheeling the boards **10** beneath the spray nozzles **134**, but also because the deposition of coatings on the boards **10** within the spray box **100** tends to be very rapid and concentrated; the vaporized liquid coating ejected by the spray nozzles **134** is substantially confined to the interior of its spray box **100** rather than escaping as lost overspray. Note that it is generally contemplated that the spray pump **144** would continuously supply liquid coating through the spray nozzles **134** once the spray pump **144** is turned on, even during the period between the time that a coated board **10** leaves the board passage **130** and another board **10** is about to be fed in. However, if desired, sensors (such as load cells/weight sensors) may be provided on the support rollers **136I/136O**, or photooptical sensors may be installed at the entry end **120** and/or exit end **122** of the board passage **130**, and/or other sensors may be used to activate the spray pump **144** (and drain pump **150**) only when a board **10** is detected in the board passage **130**. Additionally or alternatively, a foot pedal switch or similar arrangement could be used so that the user may actuate the spray pump **144** when desired.

A user generally only requires that one face of a board **10** (and one of its edges) be coated, and the spray box **100** depicted in the Figures will primarily coat the upper surface of the board **10** (the surface facing the spray nozzles **134**) and its surrounding edges. However, even though the spray nozzles **134** are directed towards the upper

surface of a board **10** traveling on the support rollers **136I/136O**, the bottom surface of the board **10** may be adequately coated as well, depending on the flow/spray rate of the liquid coating through the spray nozzles **134**. If greater coverage of the lower surface of the board **10** is desired, this can be done by increasing the flow rate of the spray nozzles **134** (thereby increasing the plume or "cloud" of overspray which will reach the bottom surface of the board **10**); by situating more spray nozzles **134** in spray nozzle apertures **132** which are off of the central axis of the board passage **130** so that more of the vaporized liquid coating billows around the side edges of the board **10** to reach its lower surface; and/or by increasing the depth of the lower portion **104** of the spray box **100** beneath the support rollers **136I/136O** so that a greater plume of overspray reaches the lower surface of the board **10**. Alternatively or additionally, additional spray nozzle apertures **132** and spray nozzles **134** may be installed at or adjacent the box floor **116** to directly spray the lower surface of the board **10**. More generally, the shape of the spray box **100** can be tailored so that the overspray plume can be directed as desired; note in **FIGS. 1** and **2** that the spray box **100** is configured with a generally oval cross-section along its length so that the air (and spray plume) within the spray box **100** circulate to some degree about the board **10**. Greater or lesser degrees of circulation can be attained with appropriate placement of spray nozzles **134** and/or appropriate shaping of the spray box **100**. Where space is provided about the sides of the board passage **130** to allow overspray to reach behind the edges of the board **10**, guide stops **154** (best seen in **FIG.**

1) may be situated above the support rollers **136I/136O** to extend between the box entry and exit ends **120** and **122** at the opposing sides of the board passage **130** so that the guide stops **154** help guide the board **10** in a straight path between the entry and exit ends **120** and **122**.

However, if it is not desired that the lower surface of a board **10** be coated, this can be addressed by decreasing the depth of the lower portion **104** of the spray box **100** beneath the support rollers **136I/136O** (since lesser depth will decrease the amount of overspray billowing about the edge of a board **10** before reaching its lower surface). This can also be addressed by effectively narrowing the board passage **130** so that there is minimal or no space between the box sidewalls **110L** and the side edges of the board **10**. This can be done, for example, by inserting removable shrouds, or installing tiltable plates between the box endwalls **112L**, which extend between the box sidewalls **110L** and the side edges of the board **10** so that overspray to the lower surface of a board **10** is blocked.

Coating operations can be further expedited if any excess liquid coating on the board **10** is at least partially wiped up, and/or if any liquid coating is more evenly distributed on the board **10**, as the board **10** exits the board passage. As depicted in **FIG. 1**, this can be done by mounting a coating application roller **156** (e.g., a common paint roller) at the exit of the board passage **130**. The application roller **156** is here depicted as being rotatably (and removably) mounted between brackets **158** descending from the

upper portion **102** of the spray box **100** so that it rolls across the top surface of an exiting board **10**. Removable mounting is useful so that the application roller **156** may be replaced with a new/clean roller **156** when desired. It is instead possible to simply provide a clip or other holding device which receives a common handle-mounted paint roller and holds it at the exit of the board passage **130** (e.g., on the upper portion **102** of the spray box **100** above the board passage aperture **126** at the exit end **122**) to urge it downwardly against an exiting board **10**. Such application rollers **156** could also or alternatively be provided within the spray box **100** if desired, though they may then need more frequent replacement owing to greater accumulation of overspray.

So that the spray box **100** is made easily portable from location to location, it is preferably provided with legs **160** descending from its lower portion **104** to terminate in (preferably lockable) wheels or casters **162**. These legs **160** may be joined by a table **164** beneath the spray box **100** whereupon the liquid coating supply bucket **140** and/or spray pump **144** may be provided if desired. Additionally, it is useful to provide at least one handle **166** on the spray box **100**, with such handles **166** most usefully being provided on the upper portion **102** of the spray box **100** to both allow the upper portion **102** to be easily opened with respect to the lower portion **104** for easy washout and maintenance when desired, and to also allow the spray box **100** to be more easily pushed and pulled from location to location.

Note that an exemplary version of the invention is shown and described above to illustrate preferred features of the invention. However, other features are also considered to be within the scope of the invention. Following is an exemplary list of such features.

First, it is emphasized that the spray box **100** may have a wide variety of sizes and configurations other than the one shown. It may also have lesser or greater features than those illustrated; as examples, it need not be formed in separate upper and lower portions **102** and **104**; it may have lesser or fewer support rollers **136I/136O**; it need not be provided on legs **160**; and it need not utilize recirculation between the drain hole **148** and the spray nozzles **134**.

Second, if desired, the support rollers **136I/136O** may be driven by a motor or other arrangement to automatically drive a board **10** through the board passage **130**, with the support rollers **136I/136O** perhaps only being driven when actuated by a sensor (with exemplary sensors being discussed earlier), or by the user.

Third, sheets, flaps, or strips of plastic, fabric, or some other yieldable material might be draped downwardly over the board passage apertures **126** to better hinder overspray from exiting the board passage apertures **126** (and also to better soak up excess liquid coating from the board **10**, or redistribute such excess coating across the surface of the board **10** in much the same manner as the coating application roller **156**). It can also be useful to extend the lip **138** bounding the board passage apertures **126** about the

entire perimeter of the board passage apertures **126** to further deter the escape of overspray.

Fourth, the spray box **100** may include blowers and/or vacuums to provide a positive pressure air curtain which hinders escape of overspray through the board passage apertures **126**. If the spray box **100** is provided with a vacuum supply pumping air (and overspray) from within the spray box **100**, and venting it to the atmosphere, it might include a filter or other means for substantially removing vaporized coating prior to ejecting such exhaust.

Fifth, additional features not previously mentioned, such as interior and/or exterior lighting for better viewing of the quality of coated work pieces, rotation counters on the rollers **136I** and/or **136O** for measuring the linear feet of coated boards **10**, and other features are also possible.

Sixth, some or all of the pumps **144** and **150** and their hoses **142**, **146**, and **152** (and the spray nozzles **134**) may be permanently connected and piped to the spray box **100**, or conversely they may be made easily removable and replaceable, with flexible hoses, quick-release fittings, and the like.

The invention is not intended to be limited to the preferred versions of the invention described above, but rather is intended to be limited only by the claims set out below. Thus, the invention encompasses all different versions that fall literally or equivalently within the scope of these claims.